Claim Amendments:

1. (currently amended) A method of consolidating unconsolidated weak zones or formations containing unconsolidated rocks and minerals to prevent sloughing and forming a chemical casing comprising the steps of:

(a) drilling the unconsolidated weak zones or formations with a drilling fluid having a pH in the range of from about 6 to about 10 and that comprises water, a polymeric cationic catalyst capable of accepting and donating protons which is adsorbed on the unconsolidated rocks and minerals, a particulate curable solid thermoset resin and a delayed acid catalyst for curing the solid resin, the drilling fluid forming a filter cake on the walls of the zone or formation that is cured by the delayed acid catalyst ~~cures~~ and consolidates the unconsolidated weak zones and formations so that sloughing is prevented; and

(b) contacting the filter cake formed in step (a) with a treating fluid that comprises water, a water soluble or dispersible polymer which is capable of being cross-linked by a thermoset resin and causing the resin to be hard and tough when cured, and a water soluble or dispersible thermoset resin, the treating fluid components depositing on the filter cake formed in step (a) and the thermoset resin catalyzed by heat or the delayed acid catalyst, or both, curing into a hard and tough cross-linked chemical casing on the walls of the zone or formation.

2. (original) The method of claim 1 wherein the unconsolidated rocks and minerals are selected from the group consisting of clays, shale and sandstone.

3. (original) The method of claim 1 wherein the polymeric cationic catalyst is selected from the group consisting of polyethyleneimine, poly(dimethylaminoethylmethacrylate) and poly(dimethylaminopropylmethacrylate).

4. (original) The method of claim 1 wherein the particulate curable solid thermoset resin is selected from the group consisting of particulate solid melamine-formaldehyde type resins, particulate solid urea-formaldehyde type resins and particulate solid phenol-formaldehyde type resins.

5. (original) The method of claim 1 wherein the particulate curable solid thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

6. (original) The method of claim 1 wherein the acid in the delayed acid catalyst is an organic or inorganic acid selected from the group consisting of p-toluene sulfonic acid, dinonylnaphthalene sulfonic acid, dodecyl benzene sulfonic acid, oxalic acid, maleic acid, hexamic acid, a copolymer of phthalic and acrylic acid, trifluoromethane sulfonic acid, phosphonic acid, sulfuric acid, hydrochloric acid, sulfamic acid and ammonium salts that produce acids when dissolved in water.

7. (original) The method of claim 1 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polymers containing one or more hydroxyl, amide, carboxyl and epoxy functional groups.

8. (original) The method of claim 1 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polyvinylalcohol, polyvinylbutyral, polyesters, polyalkylacrylic acids, polyurethanes, acrylamide polymers, proteins, polyols and polysaccharides.

9. (currently amended) The method of claim 8 <u>wherein</u> ~~whereing~~ the polysaccharide is selected from the group consisting of chitosan, hydroxyethylcellulose,

carboxymethylhydroxyethylcellulose, water soluble starches, guar gum, xanthan gum, welan gum, carragenan gum and arabic gum.

10. (original) The method of claim 1 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of melamine-formaldehyde type resins, urea-formaldehyde type resins and phenol-formaldehyde type resins.

11. (original) The method of claim 1 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

12. (currently amended) The method of claim 1 wherein the drilling fluid further comprises one or more insoluble chemical casing reinforcing materials selected from the group consisting of carbon fibers, glass fibers, mineral fibers, cellulose fibers, silica, zeolite, alumina, calcium sulfate hemihydrate, acrylic latexes, polyol-polyesters and polyvinylbutyral ~~polyvinyl butyral~~.

13. (original) The method of claim 12 wherein the one or more insoluble chemical casing reinforcing materials are present in the drilling fluid in an amount in the range of from about 2% to about 25% by weight of water in the drilling fluid.

14. (original) The method of claim 1 wherein the polymeric cationic catalyst is present in the drilling fluid in an amount in the range of from about 1% to about 15% by weight of water in the drilling fluid.

15. (original) The method of claim 1 wherein the particulate curable solid thermoset resin is present in the drilling fluid in an amount in the range of from about 5% to about 50% by weight of water in the drilling fluid.

16. (original) The method of claim 1 wherein the acid in the delayed acid catalyst is present in the drilling fluid in an amount in the range of from about 0.5% to about 8% by weight of thermoset resin in the drilling fluid.

17. (original) The method of claim 1 wherein the water soluble or water dispersible polymer which is cross-linked by the thermoset resin is present in the treating fluid in an amount in the range of from about 0.5% to about 20% by weight of water in the treating fluid.

18. (original) The method of claim 1 wherein the water soluble or dispersible thermoset resin is present in the treating fluid in an amount in the range of from about 5% to about 80% by weight of water in the treating fluid.

19. (original) The method of claim 1 wherein the drilling fluid and treating fluid both have a pH of about 8.

20. (currently amended) A method of consolidating unconsolidated weak zones or formations containing unconsolidated minerals and rocks to prevent sloughing and forming a chemical casing in a well bore penetrating the weak zones or formations to improve the mechanical strength of the well bore while drilling the well bore comprising the steps of:

(a) drilling the well bore with a drilling fluid having a pH in the range of from about 6 to about 10 and comprised of water, a polymeric cationic catalyst capable of accepting and donating protons which is adsorbed on the unconsolidated minerals and rocks, a particulate curable solid thermoset resin and a delayed acid catalyst for curing the solid resin, the drilling fluid forming a filter cake on the walls of the well bore that <u>is cured by the delayed acid catalyst</u> ~~cures~~ and consolidates the unconsolidated weak zones and formations penetrated by the well bore so that sloughing is prevented; and

(b) contacting the well bore with a treating fluid that comprises water, a water soluble or dispersible polymer which is capable of being cross-linked by a thermoset resin and causing the resin to be hard and tough when cured, and a water soluble or dispersible thermoset resin, the treating fluid components depositing on the filter cake formed in step (a) and the thermoset resin catalyzed by heat or the delayed acid catalyst, or both, curing into a hard and tough cross-linked chemical casing on the walls of the well bore.

21. (original) The method of claim 20 wherein the unconsolidated minerals and rocks are selected from the group consisting of clays, shale and sandstone.

22. (original) The method of claim 20 wherein the polymeric cationic catalyst is selected from the group consisting of polyethyleneimine, poly(dimethylaminoethylmethacrylate) and poly(dimethylaminopropylmethacrylate).

23. (original) The method of claim 20 wherein the particulate curable solid thermoset resin is selected from the group consisting of particulate solid melamine-formaldehyde type resins, particulate solid urea-formaldehyde type resins and particulate solid phenol-formaldehyde type resins.

24. (original) The method of claim 20 wherein the particulate curable solid thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

25. (original) The method of claim 20 wherein the acid in the delayed acid catalyst is an organic or inorganic acid selected from the group consisting of p-toluene sulfonic acid, dinonylnaphthalene sulfonic acid, dodecyl benzene sulfonic acid, oxalic acid, maleic acid, hexamic acid, a copolymer of phthalic and acrylic acid, trifluoromethane sulfonic acid,

phosphonic acid, sulfuric acid, hydrochloric acid, sulfamic acid and ammonium salts that produce acids when dissolved in water.

26. (original) The method of claim 20 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polymers containing one or more of hydroxyl, amide, carboxyl and epoxy functional groups.

27. (original) The method of claim 20 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polyvinylalcohol, polyvinylbutyral, polyesters, polyalkylacrylic acids, polyurethanes, acrylamide polymers, proteins, polyols and polysaccharides.

28. (original) The method of claim 27 wherein the polysaccharide is selected from the group consisting of chitosan, hydroxyethylcellulose, carboxymethylhydroxyethylcellulose, water soluble starches, guar gum, xanthan gum, welan gum, carragenan gum and arabic gum.

29. (original) The method of claim 20 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of melamine-formaldehyde type resins, urea-formaldehyde type resins and phenol-formaldehyde type resins.

30. (original) The method of claim 20 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

31. (currently amended) The method of claim 20 wherein the drilling fluid further comprises one or more insoluble chemical casing reinforcing materials selected from the group consisting of carbon fibers, glass fibers, mineral fibers, cellulose fibers, silica, zeolite, alumina, calcium sulfate hemihydrate, acrylic latexes, polyol-polyesters and <u>polyvinylbutyral</u> ~~polyvinyl butyral~~.

32. (original) The method of claim 31 wherein the one or more insoluble chemical casing reinforcing materials are present in the drilling fluid in an amount in the range of from about 2% to about 25% by weight of water in the drilling fluid.

33. (original) The method of claim 20 wherein the polymeric cationic catalyst is present in the drilling fluid in an amount in the range of from about 1% to about 15% by weight of water in the drilling fluid.

34. (original) The method of claim 20 wherein the particulate curable solid thermoset resin is present in the drilling fluid in an amount in the range of from about 5% to about 50% by weight of water in the drilling fluid.

35. (original) The method of claim 20 wherein the acid in the delayed acid catalyst is present in the drilling fluid in an amount in the range of from about 0.5% to about 8% by weight of thermoset resin in the drilling fluid.

36. (original) The method of claim 20 wherein the water soluble or water dispersible polymer which is cross-linked by the thermoset resin is present in the treating fluid in an amount in the range of from about 0.5% to about 20% by weight of water in the treating fluid.

37. (original) The method of claim 20 wherein the water soluble or dispersible thermoset resin is present in the treating fluid in an amount in the range of from about 5% to about 80% by weight of water in the treating fluid.

38. (original) The method of claim 20 wherein the drilling fluid and treating fluid both have a pH of about 8.

39. (original) A method of consolidating unconsolidated weak zones or formations formed of unconsolidated minerals and rocks to prevent sloughing and forming a chemical casing in a well bore penetrating the weak zones or formations to improve the mechanical

strength of the well bore or to provide zonal isolation, or both, while drilling the well bore comprising the steps of: (a) drilling the well bore with a drilling fluid having a pH of about 8 and comprised of water, a cationic, polyethyleneimine catalyst which is adsorbed on the unconsolidated minerals and rocks and is present in an amount in the range of from about 2% to about 10% by weight of water in the drilling fluid, a particulate curable solid alkyl ether of a melamine-formaldehyde resin present in an amount in the range of from about 10% to about 30% by weight of water in the drilling fluid and a dispersible delayed ammonium chloride acid catalyst for curing the resin present in the drilling fluid in an amount in the range of from about 1% to about 6% by weight of the resin, the drilling fluid forming a filter cake on the walls of the well bore that cures and consolidates the unconsolidated weak zones and formations penetrated by the well bore so that sloughing is prevented; and (b) contacting the well bore with a treating fluid comprised of water, a water soluble or dispersible polysaccharide polymer which is capable of being cross-linked by a thermoset resin and causing the resin to be hard and tough when cured present in the treating fluid in an amount in the range of from about 1% to about 10% by weight of water in the treating fluid, a water soluble or dispersible alkyl ether of melamine-formaldehyde resin present in the treating fluid in an amount in the range of from about 20% to about 70% by weight of water in the treating fluid, the treating fluid components depositing on the filter cake formed in step (a) and the resins curing into a hard and tough cross-linked chemical casing on the walls of the well bore.

40. (currently amended) A method of consolidating unconsolidated weak zones or formations formed of clays, shale and sandstone ~~sand-stone~~ to prevent sloughing and forming a chemical casing in a well bore penetrating the weak zones or formations to improve the mechanical strength of the well bore while drilling the well bore comprising the steps of:

(a) drilling the well bore with a drilling fluid having a pH in the range of from about 6 to about 10 and comprised of water, a polymeric cationic catalyst capable of accepting and donating protons which is adsorbed on the unconsolidated clays, shale and sandstone ~~sand stone~~, a particulate curable solid thermoset resin and a delayed acid catalyst for cuing the solid resin, the drilling fluid forming a filter cake on the walls of the well bore that is cured by the delayed acid catalyst ~~cures~~ and consolidates the unconsolidated weak zones and formations penetrated by the well bore so that sloughing is prevented; and

(b) contacting the well bore with a treating fluid comprised of water, a water soluble or dispersible polymer which is capable of being cross-linked by a thermoset resin and causing the resin to be hard and tough when cured and a water soluble or dispersible thermoset resin, the treating fluid components depositing on the filter cake formed in step (a) and the thermoset resin catalyzed by heat or the delayed acid catalyst, or both, curing into a hard and tough cross-linked chemical casing on the walls of the well bore.

41. (original) The method of claim 40 wherein the polymeric cationic catalyst is selected from the group consisting of polyethyleneimine, poly(dimethylaminoethylmethacrylate) and poly(dimethylaminopropylmethacrylate).

42. (original) The method of claim 40 wherein the particulate curable solid thermoset resin is selected from the group consisting of particulate solid melamine-formaldehyde type resins, particulate solid urea-formaldehyde type resins and particulate solid phenol-formaldehyde type resins.

43. (original) The method of claim 40 wherein the particulate curable solid thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

44. (original) The method of claim 40 wherein the acid in the delayed acid catalyst is an organic or inorganic acid selected from the group consisting of p-toluene sulfonic acid, dinonylnaphthalene sulfonic acid, dodecyl benzene sulfonic acid, oxalic acid, maleic acid, hexamic acid, a copolymer of phthalic and acrylic acid, trifluoromethane sulfonic acid, phosphonic acid, sulfuric acid, hydrochloric acid, sulfamic acid and ammonium salts that produce acids when dissolved in water.

45. (original) The method of claim 40 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polymers containing one or more of hydroxyl, amide, carboxyl and epoxy functional groups.

46. (original) The method of claim 40 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polyvinylalcohol, polyvinylbutyral, polyesters, polyalkylacrylic acids, polyurethanes, acrylamide polymers, proteins, polyols and polysaccharides.

47. (original) The method of claim 46 wherein the polysaccharides are selected from the group consisting of chitosan, hydroxyethylcellulose, carboxymethylhydroxyethylcellulose, water soluble starches, guar gum, xanthan gum, welan gum, carragenan gum and arabic gum.

48. (original) The method of claim 40 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of melamine-formaldehyde type resins, urea-formaldehyde type resins and phenol-formaldehyde type resins.

49. (original) The method of claim 40 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

50. (currently amended) The method of claim 40 wherein the drilling fluid further comprises one or more insoluble chemical casing reinforcing materials selected from the group consisting of carbon fibers, glass fibers, mineral fibers, cellulose fibers, silica, zeolite, alumina, calcium sulfate hemihydrate, acrylic latexes, polyol-polyesters and polyvinylbutyral ~~polyvinyl butyral~~.

51. (original) The method of claim 50 wherein the one or more insoluble chemical casing reinforcing materials are present in the drilling fluid in an amount in the range of from about 2% to about 25% by weight of water in the drilling fluid.

52. (original) The method of claim 40 wherein the polymeric cationic catalyst is present in the drilling fluid in an amount in the range of from about 1% to about 15% by weight of water in the drilling fluid.

53. (original) The method of claim 40 wherein the particulate curable solid thermoset resin is present in the drilling fluid in an amount in the range of from about 5% to about 50% by weight of water in the drilling fluid.

54. (original) The method of claim 40 wherein the acid in the delayed acid catalyst is present in the drilling fluid in an amount in the range of from about 0.5% to about 8% by weight of thermoset resin in the drilling fluid.

55. (original) The method of claim 40 wherein the water soluble or water dispersible polymer which is cross-linked by the thermoset resin is present in the treating fluid in an amount in the range of from about 0.5% to about 20% by weight of water in the treating fluid.

56. (original) The method of claim 40 wherein the water soluble or dispersible thermoset resin is present in the treating fluid in an amount in the range of from about 5% to about 80% by weight of water in the treating fluid.

57. (original) The method of claim 40 wherein the drilling fluid and treating fluid both have a pH of about 8.

58. (currently amended) A method of consolidating unconsolidated weak zones or formations formed of clays, shales and sandstone ~~sand-stone~~ to prevent sloughing and forming a chemical casing in a well bore penetrating the weak zones or formations to improve the mechanical strength of the well bore or to provide zonal isolation, or both, while drilling the well bore comprising the steps of: (a) drilling the well bore with a drilling fluid having a pH of about 8 and that comprises water, a cationic, polyethyleneimine catalyst which is adsorbed on the unconsolidated clays, shales and sandstone ~~sand-stone~~ and is present in an amount in the range of from about 2% to about 10% by weight of water in the drilling fluid, a particulate curable solid alkyl ether of a melamine-formaldehyde resin present in an amount in the range of from about 10% to about 30% by weight of water in the drilling fluid and a dispersible delayed ammonium chloride acid catalyst for curing the resin present in the drilling fluid in an amount in the range of from about 1% to about 6% by weight of the resin, the drilling fluid forming a filter cake on the walls of the well bore that cures and consolidates the unconsolidated weak zones and formations penetrated by the well bore so that sloughing is prevented; and (b) contacting the well bore with a treating fluid comprised of water, a water soluble or dispersible polysaccharide polymer which is capable of being cross-linked by a thermoset resin and causing the resin to be hard and tough when cured present in the treating fluid in an amount in the range of from about 1% to about 10% by weight of water in the treating fluid, a water soluble or dispersible alkyl ether of melamine-formaldehyde resin present in the treating fluid in an amount in the range of from about 20% to about 70% by weight of water in the treating fluid, the treating fluid components

depositing on the filter cake formed in step (a) and the resins curing into a hard and tough cross-linked chemical casing on the walls of the well bore.